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ABSTRACT

Part of a series of instructor training modules on related subjects instruction for apprentices, this booklet deals with planning related subjects instruction. The first chapter consists of an outline of the content and scope of the instructor training modules as well as a self-assessment pretest. Covered in the module are identifying specific knowledges, skills, and attitudes for inclusion in related subjects; establishing standards for successful performance; and providing for appropriate use and a variety of instructional time, activities, and materials. Each chapter contains some or all of the following: an introduction and objectives, instructional text, an example, additional information, and self-test exercises. Appended to the booklet are answers to the self-test exercises, a posttest, and answers to the posttest. (MN)

PLANNING RELATED SUBJECTS INSTRUCTION

Instructor Training Module #3

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Glossary

The words on this list are used in this booklet. Please review the terms and learn the definitions. The meanings of the words as used in the text may not be the form of the work with which you are familiar.

Words/Terms

1. *Amenable* Able to be persuaded or capable of being judged
2. *Anticipate* Expect
3. *Application* Solving of a problem in a new situation, using knowledge gained in instruction
4. *Appropriate* Proper or fitting
5. *Attitude* A feeling, emotion, posture and subsequent behavior toward a fact or situation
6. *Circumstances* Events or setting surrounding some action or activity
7. *Composite* Made up of separate parts
8. *Comprehension* Mastery or learning of specific facts and concepts
9. *Constitute* To make up or compose
10. *Criterion* Element or quality of performance to be judged, such as speed or accuracy
11. *Definitively* Explicitly, conclusively and thoroughly done
12. *Level of Success* Value or score of assessment, stated to separate acceptable from unacceptable performance
13. *Operations* Modes or courses of action
14. *Optimal* The best or most favorable
15. *Performance* An action or presentation in accord with some expectation
16. *Prerequisite* A requirement necessary for something else to follow
17. *Proscribe* To prohibit
18. *Standard* A rule that can be used to judge the value of a performance
19. *Systematizing* Grouping according to principles
20. *Type of Reasoning* The type of thinking in which the apprentice must engage to use the knowledge or skill under consideration

1. How To Use This Booklet

What Is the Series About?

Related subjects instruction is an essential part of every apprenticeship program. It is the program component through which apprentices are taught the background theory and range of application of associated technical subjects such as mathematics, science and safety. Related instruction usually takes place in a classroom, after the regular workday is over. Most frequently, related instruction is taught by a skilled tradesperson or craftworker. For the tradesperson or craftworker to be an effective trainer, he or she must not only know their trade skill, but also they must use teaching skills appropriate for conveying that information to apprentices. This series of materials is written to train related subjects instructors in the critical teaching skills necessary to perform their jobs effectively. The titles of the booklets in the series are

1. *Introduction to Related Subjects Instruction and Inservice Training Materials*
2. *Planning the Apprenticeship Program*
3. *Planning Related Subjects Instruction*
4. *Developing Instructional Materials for Apprentices*
5. *Presenting Information to Apprentices*
6. *Directing Learning Activities for Instruction*
7. *Providing for Individual Learner Needs*
8. *Controlling Instructional Settings*
9. *Evaluating Apprentice Performance*
10. *Communicating with Apprentices*

The first booklet introduces the series, describes the content of each booklet, and provides an overview of apprenticeship and of adult learners. The second booklet describes how to plan an apprenticeship program and may be used by vocational educators, related instructors, sponsors or service agencies. Each of the other eight booklets deals with a set of training skills judged by a panel of experts on apprenticeship to be critical to working effectively as a related subjects instructor.

What Is This Booklet About?

The materials in this booklet are about planning instruction in related subjects training, one of your major responsibilities as a related subjects instructor. The outcomes of the training experience depend in large measure on the care and thoroughness that you as a related subjects instructor exercise in making decisions in preparation to teach. These preparations include decisions about content to be taught to apprentices, topical emphasis within content, degree of expected skill/knowledge acquisition, time use, resource use, topic sequence, type of instructional material and the type of presentation to be made. To plan instruction effectively and efficiently requires that you perform confidently a variety of skills, the four most critical of which are described in this booklet.

1. Identify specific knowledges, skills and attitudes for inclusion in related subjects instruction,
2. Develop and specify performance objectives for related subjects,
3. Determine standards of performance, and
4. Provide for appropriate use and variety of instructional time, activities and materials.

What Must I Do To Complete My Work In This Booklet?

Working your way through this booklet will require you to read the text, to answer the questions, to perform the exercises, and to complete the pre- and post-assessment instruments. Expect to spend about three to four hours working through the materials. The only resources you need to complete your work in this booklet are (1) a copy of the booklet; (2) a pencil or pen, (3) about three-to-four hours of time; and (4) recollection of past related instruction experiences.

The materials are written in a self-instructional, programmed format. You may work through the text, examples and questions at your own pace and leisure, you need not complete your work in the booklet at one sitting.

Each chapter in the booklet is devoted to a single skill. The general format of the chapters is similar, with the following parts:

1. An *introduction* describing the skill and the instructional objectives for that skill.
2. *What* is, *when* and *why* to use the skill.
3. Step-by-step *directions* for how to perform the skill.
4. An *example* of how the skill is used in related instruction.
5. A *self-test exercise* to apply the information about the skill.
6. Additional *sources of information*.

This booklet concludes with an appendix that contains the answers to the self-test exercises from each chapter and the posttest

Your activities in working through this booklet should include, in order, the following things

- Complete the self-assessment,
- Read and consider in detail the introduction and objectives for each skill,
- Read and study the text, examples and illustrations provided for each skill,
- Complete the self-test exercise for each chapter and compare your answers with those provided in the appendix,
- If you complete the exercise as directed, continue your work in the booklet, if you fail to answer the questions correctly, repeat your work in the chapter under consideration, and
- At the conclusion of the booklet, complete the posttest for the unit. Check your answers against those provided. If you exceed the criteria, continue your work in the next booklet, if you fail to demonstrate mastery, repeat portions of this booklet as needed.

How Much Do I Know About the Subject Before I Begin?

The self-assessment will assist you to focus on competency areas associated with planning instruction. Read each competency statement listed in Figure 1 and assess your level of knowledge about and your level of skill in performing that task. Knowledge means what you know about the subject while skill means your experience in successfully performing the task. Circle the number that best describes your level of knowledge and skill. Competencies where your ratings are poor or fair are those that you should concentrate on Pay particular attention to the chapters which deal with those competencies

Figure 1: PLANNING RELATED SUBJECTS INSTRUCTION—SELF ASSESSMENT

CHAPTERS	COMPETENCIES		RATING			
			Poor	Fair	Good	Excellent
2 Skill: Identify Specific Knowledges, Skills and Attitudes for Inclusion in Related Subjects Instruction	1 Identify work activities and tasks	Knowledge	1	2	3	4
		Skill	1	2	3	4
	2 Determine skills, knowledges and attitudes necessary for performing work activities	Knowledge	1	2	3	4
		Skill	1	2	3	4
	3 Group skills, knowledges and attitudes into topics and subjects as content	Knowledge	1	2	3	4
		Skill	1	2	3	4
3 Skill Develop and Specify Performance Objectives	4 Construct performance objectives	Knowledge	1	2	3	4
		Skill	1	2	3	4
	5 Determine and utilize several different levels of reasoning/thinking/operation among learners	Knowledge	1	2	3	4
		Skill	1	2	3	4
	6 Specify conditions of performance	Knowledge	1	2	3	4
		Skill	1	2	3	4
4 Skill Determine Standards of Performance	7 Specify standards of performance including criteria and levels of success	Knowledge	1	2	3	4
		Skill	1	2	3	4
5 Skill Provide for Appropriate Use and Variety of Instructional Time, Activities and Materials	8 Identify factors/decisions to make when planning instruction	Knowledge	1	2	3	4
		Skill	1	2	3	4
	9 Sequence materials	Knowledge	1	2	3	4
		Skill	1	2	3	4
	10 Develop a Plan for Instruction	Knowledge	1	2	3	4
		Skill	1	2	3	4

2. Skill: Identify Specific Knowledges, Skills and Attitudes for Inclusion in Related Subjects Instruction

Introduction and Objectives

The primary task of planning instruction is deciding what to teach. For you as a related subjects instructor, this process involves three operations: (1) identifying the knowledges, skills and attitudes necessary for successful job performance, (2) deciding on the appropriateness of the information for inclusion in related instruction, and (3) fitting the information into a content framework for the related subjects instructional experience. To perform these tasks effectively, you must use the competencies explained in this chapter. When you have completed your work in this booklet, you will demonstrate your capabilities by being able to:

1. Identify the aspects of the job analysis process,
2. Critique a job analysis to identify necessary skills, knowledges and attitudes,
3. Suggest ways of grouping and relating identified necessary skills, knowledges and attitudes, and
4. Outline a procedure to identify specific knowledges, skills and attitudes for your own related subjects instructional responsibilities.

As you begin to work through this unit of materials, reflect on the ways you have identified necessary skills and knowledges in related instruction in the past. Consider how the ideas suggested in these materials could be incorporated into current practice.

What, Why and When To Identify Skills, Knowledges and Attitudes

The underlying purpose of related subjects instruction is to provide apprentices with important work-related information that is not taught on-the-job. Such information may consist of: (1) knowledge about facts and principles, (2) skills necessary to perform a work task, and (3) attitudes or the manner of acting that displays opinions and values.

The information presented during related studies instruction is termed content. Sometimes the content is prescribed and proscribed by national trade, craft or union organizations. More frequently, you as a related instructor and craftsperson are expected to determine the content within topical guidelines provided by the local, state or national program sponsor. Usually these guidelines may specify broad subject areas such as basic mathematics, blueprint reading and interpersonal communications. Sometimes they even may suggest an optimal number of hours of contact time within each broad subject area. It is your responsibility to determine the topics within the broad subject areas and to ensure that the topics coincide with the necessary knowledges, skills and attitudes for working on the job. This means that you must be familiar with the requirements of the job, the potential topics within subject areas, and procedures for identifying and grouping skills and knowledges into instructional areas. This is particularly important and difficult for related subjects instruction because, unlike traditional education, you must be concerned not only with background knowledge, but also with the application of knowledge in the form of skills. Further, all information must relate directly to the specific craft or trade.

You must identify necessary knowledges, skills and attitudes for content before beginning the related subjects instructional process. You must decide on the exact training content, the requirements for instructional materials, the expect outcomes to include in the performance objectives, and a suggested order and emphasis for teaching the materials. Not only must you identify specific knowledges, skills and attitudes before beginning training, you also must consider these issues periodically throughout the instructional period in order to determine if your training efforts are effective. Such assessments during the instructional term generally occur in conjunction with evaluating apprentice learning and performance.

How To Identify Specific Knowledges, Skills and Attitudes for Each Performance Objective

There are a series of steps through which you can expedite the process of identifying specific knowledges, skills and attitudes. Each step is logical and uses information resulting from the preceding steps. Steps two through six are a procedure for performing a simple job analysis. The other steps suggest how to use the information from the analysis.

Step 1: Assemble Content Ideas

Collect from a variety of sources the suggested subject content for your related subjects activity. Content

may include subject areas suggested by the sponsor, by national guidelines/standards for the industry, by major textbooks in the study area, by previous related subjects instructional activities and by your own ideas. Compile the subject areas and topics into similar categories such as basic mathematics, basic measurement, tools and working in organizations. Where appropriate list topics within each major topic under the same subject heading. For example, under basic mathematics you might list topics such as use of percentages, area computation, decimal fractions and so forth. Also note suggested time and proficiency requirements if they are offered.

Step 2. Develop Job Analysis Chart

Construct the chart illustrated in Figure 2 for the job analysis. Leave space under each category to record important information.

Step 3: Identify Work Activities

Identify work activities for the trades or crafts of the apprentices in your charge. Usually you can identify work activities from your own experience, by talking with journeymen in the craft or trade, by observation, by talking with the program sponsor and by talking with apprentices. Develop a list of work activities, usually as a description of tasks performed on the job. In addition, you should note those activities that are performed most frequently, those that are considered most important and those that are prerequisite tasks for later activities. Note this information in the chart with the listing of activities.

Step 4: Note Equipment Use

Identify equipment used on the job, noting what is used, when it is used, how it is used and to what end. Add this information to the data about work activities in

Figure 2. JOB ANALYSIS

Craft/Trade _____ Job: _____

Activities	Frequency of Occurrence	Importance	Equipment Used	Performance/ Outcomes	Job Context Concerns	Safety Requirements	Applications

the chart It is one method of refining some of the earlier descriptions

Step 5 Assess Quality Standards

Identify required, acceptable work performance or outcomes for each listed work activity Focus your thinking on such items as the ways of measuring amount and quality of work performed Formal on-the-job work evaluation techniques also should be included in this step Add these notes to your listing of work activities

Step 6 Identify Job Context

Note any job context circumstances that are critical to successful work performance Items to consider include work schedules, working conditions, work incentives and the organization and social situation of the work place Add this information as a separate topic to the list of activities *unless* the particular information influences job performance directly, in such cases, enter the information with the job activity

Step 7 List Safety Considerations

List any important safety considerations for each activity Attend especially to equipment use in completing this column Check your specific legal obligations as you think through each activity

Step 8. Group Information

Examine the job analysis list of activities and think specifically about what a worker must know in order to perform successfully the activities you have listed Use the following checklist as a way of considering the types of knowledges an apprentice must possess to perform some of the activities you might have listed

1 Scientific principles
2 Mathematical operations and formulas
3 Necessary safety precautions
4 Safety procedures in case of accident
5 Tool identification
6 Tool use procedures
7 Measurement terms
8 Measurement operations
9 Measurement quantities
10 Communication skills (oral, written, graphic)
11 Reading requirements (types and level of difficulty)
12 Types of energy
13 Types of matter and materials
14 Necessary notations, symbols and signs
15 Social and organizational constraints/expectations
16 Working with others
17 Necessary reactions and responses
18 Decisions to be made

You may want to condense this list to only those topics that you can cover in your related subjects effort

In performing this step you will find it efficient to take each activity you listed on your job analysis sheet, one at a time, and work through the list or condensed list of types of skills and knowledges Many instructors list each activity on a note card or piece of paper and proceed to record under the activity name all the topics within each of the suggested types of skills and knowledges appropriate to that activity. For example, for an activity such as mitering a cabinet corner there might be listed, at a minimum, topics such as identification and use of a measuring tape, identification and use of a miter and T-square, selection of lumber, identification and use of miter box, measurement in inches, centimeters and millimeters, safety precautions and types of decisions to be made

Step 9 Decide on Content

Review the list of activities and the topics associated with each listed activity Group identical and similar topics from throughout the entire listing of activities and place the composite topics under similar headings For example, you might find references to solving for unknowns, algebra, equations and compound fractions spread across your lists These items might be compiled into a single heading of solving compound fractions Further, this topic could have been grouped under a heading entitled basic mathematics Other subject headings in addition to basic mathematics frequently found in related subjects instruction may be sketching, drawing and blueprint reading, measurement, tools, safety, law and labor relations, working in organizations, interpersonal skills and communications, general physical science, property of matter and materials, occupational procedures, job reading and writing literacy, job seeking, obtaining and retraining skills, management and supervision, economics and introduction to apprenticeship Refer to this list to help you complete your job analysis Save the activities list you developed, you can use it as examples of knowledge application

After compiling and grouping the assorted topics, you must examine the list in order to decide, for each listed item, if the content is more appropriately taught in related subjects instruction or on-the-job In making this decision, consider if the subject matter is amenable to presentation in your related subjects training situation Also consider if it is likely to be covered sufficiently on-the-job, if special equipment is required and if it fits logically into other related subjects requirements. You would do well to discuss these matters with the apprentice and with the apprentice's on-the-job supervisor As a rule of thumb, if there are doubts about the

content being covered on the job, include it in your related subjects efforts for the apprentice.

You may find it useful to construct a chart like that shown in Figure 3 to display and group information for use in planning instruction. Notice that the activities are listed on the left and the suggested content areas are noted along the top right. You can expand the chart to include all suggested major topics or subject areas. As you lay out the information in this way, you will find it easier to group similar information and to plan.

Example

Ricardo Ruiz, a chef supervisor in a major western resort hotel, was responsible for overseeing the work of several other journeymen and apprentice chefs who were trained in the kitchen of the flagship hotel for service in other hotels in the chain. Ruiz, one of three chefs in the kitchen, also was the related subjects instructor in the employer sponsored apprenticeship program for chefs operated by the hotel chain. He was responsible

Figure 3 DISPLAY OF PROPOSED CONTENT FOR STEP #9 DECIDE ON CONTENT

Job Activities		Related Subjects Instruction				
Activities/Skills in Chronological Order	Equipment Required for Skills to be Taught	Math Required	Science Required	Other Information Safety Blueprint Reading	Auxiliary Information	References and Needed Instructional Materials
1 Selection of materials to be cut						
2 Layout and marking miter						
3 Cutting the miter	Combination square, backsaw, miter box, wood clamp, etc	Measurements in conventional system and metric system Whole numbers and fractions	Determination of wood grain and point to start the cut	Reading comprehension Safety instruction Splintering Reading a blueprint	Wood types How to "cope" a molding Types of moldings	Handbooks, magazine articles, films, etc
4 (etc.)						

for developing and conducting the related subjects instructional activities for all first- and second year chef apprentices. He had little guidance in developing related subjects content other than his own considerable experience and the general hotel policy on meal preparation which was summarized as a commitment to fresh, first quality ingredients, house specialities that rotated on a two week schedule, and an expected ratio of food cost to menu price of 7 to 1.0.

In order to determine what to teach in related subjects instruction, Ruiz followed the several steps presented in this booklet. He examined his own experience and activities as well as that of the other chef supervisors and the several journeyworker chefs in order to develop a list of activities and tasks performed on the job. He also noted the equipment used, the organizational context, work performance requirements and the frequency and importance of each listed activity. Next, using the checklist of types of knowledges presented in Step 7 and the grouping techniques suggested in Step 8, Ruiz developed a master list of subjects and topics to cover. Finally, using that information he developed a chart of content similar to that suggested in Figure 3 for first- and second-year apprentices. Using the chart in Figure 4, Ruiz ordered the content and tailored it to the work situation of each apprentice chef. Finally, he adjusted the content emphasis so that it accurately reflected the importance of various activities as well as the chronological order in which activities are performed on the job.

Figure 4. TABLE OF CONTENT SPECIFICATIONS

ACTIVITIES (Years 1–2)	Importance Rating 1-2-3	CONTENT SUBJECT AREAS															
		Safety			Measurement					Basic Science				Interpersonal Skills			
		Protection Devices	Responsibility	Tools	Clothing & Hygiene	Quantity	Tools	Tables	Weights/Volumes	Energy	Materials	Liquids Gases		Working Under Super	Directions	Job Literacy	Feedback
1 Clean work area	2	X	X	X										X	X		X
2 Clean mixer, slicer, grill, oven, etc	1			X	X									X	X		X
3 Set out tools for meal	3			X	X		X	X						X	X		X
4 Stock supplies	3		X			X			X		X			X	X		X
5 Serve portions	3				X	X	X	X	X					X	X		X
6 Operate machinery	1	X	X	X	X			X		X	X	X		X	X		X
7 Read, listed, recite recipes	1					X		X	X		X	X		X	X	X	X
8 Measure ingredients	1				X	X	X	X	X	X	X	X		X	X	X	X
9. Mix ingredients	1				X	X	X	X	X		X	X		X	X	X	X
10 Prepare dishes	1	X			X	X	X	X	X	X	X	X		X	X		X

1 = most important; 3 = least important

Self-Test Exercises

Please answer the following questions in the space provided or on separate work paper. Check your answers by referring to the appendix in the back of the booklet.

1. List the steps in the suggested job analysis procedure.

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

h. _____

i. _____

2. Read the following list of knowledges and information. Group similar items together and suggest a general subject category name for each grouping. While space is provided for up to six categories you are welcome to generate more or fewer categories.

a. determine weights
b. constructive criticism
c. toxic substances
d. provisions of apprenticeship
e. noise
f. whole numbers
g. time cards/pay checks
h. apprenticeable occupations
i. protective devices
j. pride in work
k. fractions
l. working under supervision
m. use of tables
n. determine angles

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

3. Consider your own related subjects instructional responsibilities. Outline a procedure for determining what to teach.

3. Skill: Develop and Specify Performance Objectives for Related Subjects

Introduction and Objectives

Perhaps the most critical tasks in planning for instruction are deciding and explaining exactly what you must teach. These tasks are critical because in apprenticeship your goal is to help *each* apprentice eventually acquire all necessary knowledge and skills for his or her selected craft or trade. That requires that both you and the trainee learns and characteristics of the trade or craft tent and outcomes. This is particularly important in apprenticeship because learning involves doing, watching, discussing, reading and using any other means available to acquire and apply information. Trainees are expected to learn and to succeed.

The exact time span for learning any particular aspect of an occupation varies according to how quickly the trainer learns and characteristics of the trade or craft. Instruction often is organized around individual strengths and limitations and may use a variety of means to convey information. Individual records on learning and on time spent in instruction are maintained for each apprentice. Outcomes of instruction are emphasized and are expressed as objectives. Objectives indicate expected learning in performance terms. They explain exactly how the apprentice must behave or perform, how well she or he must perform, and under what conditions the performance must take place. Objectives are shared with apprentices, and become the instructional goals for the class.

Writing objectives requires you to combine several competencies and types of information. It is a time-consuming process in planning instruction, but pays dividends in terms of overall organization and weekly preparation for your related subjects instructional activities. When you have completed your work in this unit of materials, you will demonstrate your competency in this skill by being able to.

1. Construct and critique specific instructional behavioral performance objectives using two different types of reasoning;
2. Identify the parts of a performance objective, and
3. Specify the elements or conditions of performance objectives.

What Are and Why Specify Performance Objectives

Performance objectives are the behavioral goals you establish for the apprentices in your charge. Objectives declare instructional intent by describing what the learner will be able to do after instruction that they could not do before instruction. They provide course direction and focus for the learner and for you.

Objectives can be stated at several organizational levels, each of which has specific purposes. For example, objectives may be established at the State level by the State Joint Apprenticeship Committee as goals and policy, objectives may be local objectives established by the local JAC or the local education agency participating in the program and function as guidelines or directions, or objectives may be class-specific, established by you as an instructor and developed to direct and to focus related subjects training activities. At any level—and particularly when used at the training level—observe the following principles of objective writing as you develop objectives.

1. Objectives should be *worthwhile and significant*. They should emphasize the most important content points and ignore trivial information.
2. Objectives should be *achievable*. They should not be set either artifically high or artifically low.
3. Objectives should be *measurable*. They should suggest appropriate evaluation strategies and techniques. Further, objectives should indicate desired changes in learner performance that will result from the instruction.
4. Objectives should be *precise*. They should be specific enough to serve as guides for selecting instructional strategies and materials.
5. Objectives should be *shared*. They should be conveyed to everyone involved in the instructional task.

How To Write Performance Objectives

General objectives such as those established by the State Joint Apprenticeship Committee for policy are

called goals. Goals describe anticipated outcomes in a manner that makes them measurable.

Writing objectives is fairly easy *if* you have a general outline to follow as you construct your objective statements. The important components of objectives are:

- *Who* must perform the desired behavior. The person or group of persons—apprentice or percentage of the class—is noted.
- *What* behavior must be performed in demonstrating mastery. The task, behavior or performance is described in verb form.
- *To What Result*. The outcome of the application of knowledge or skill must be specified in procedure and product form.
- *How Well*. The standard to which the apprentice must perform in order to be judged successful must be stated. This standard can be specified as speed, errors, quality, percent of answers correct or by a variety of other criteria.
- *Under What Conditions*. The conditions under which the performance must occur must be specified, noting any factors that may encourage or interfere with performance.

Below is a sample structure for writing an instructional behavioral objective. Note that each part of the objective has been labeled.

In this example, the objective is detailed enough to reflect the specific teaching content, to suggest the type of measurement to be used in evaluation and to indicate the circumstances such as time and materials under which the specific performance must take place. In this way, content and apprentice behavior is included in the objectives.

Use the following steps to simply the process of writing your performance objectives.

Step 1: Review Content and Outcomes

Review course content and proposed learning outcomes to determine the content of the performance objective. Consider again the inputs to the program such as industry guidelines, the task/activity analyses of subject crafts or trades, sponsor demands and your own experience as a craftworker. Usually you will need to develop at least one performance objective for each major content and each major expected outcome within related subjects instruction.

Step 2: Note Who

Decide exactly who will perform the desired behavioral outcome. Will individual apprentices demonstrate the skill or knowledge or will apprentices grouped by trade/craft, by year, or the entire group demonstrate the learning task. Make this decision for

Figure 5. SAMPLE INSTRUCTIONAL BEHAVIORAL OBJECTIVES

Each plumbing apprentice
(Who)

will solve
(What)

a set of math problems about the necessary fall in drainage lines
(To what result)

achieving a score of 90% within 1 centimeter tolerance on
(How well)

a paper and pencil test of written problems using blueprints within the

second six-month period of related instruction.
(Under what conditions)

each proposed outcome that you write as a performance objective. Note your decision beside the proposed outcome on a page.

Step 3: Note What

Determine precisely what behavior will be performed. As a related subjects instructor this is difficult because not only must you be concerned with learning knowledge, but you also must be concerned with applying the information to job-specific tasks. Further, you must be concerned with instilling appropriate work attitudes and with reinforcing manipulative skills associated with the apprentice's work.

Your primary responsibilities are teaching apprentices to comprehend and apply information. Comprehension means mastery of specific facts and concepts. It involves understanding the meaning of a communication and includes directions and instructions. Application means problem solving in new situations using knowledge and skills gained during instruction. Avoid the pitfall of concentrating too heavily on the areas of comprehension or knowledge. Instead attend particularly to the area of application. Remember, that application includes action, knowledge and comprehension. Application means that apprentices, when presented with a problem unlike any they have seen, can recall, interpret and apply knowledge and skills they possess to perform successfully in the new situation.

When writing behavioral objectives and when devising testing techniques for each objective, the type of reasoning or performance is expressed as the *what* in the objective. It is a verb that describes the general performance outcome. Table 1 displays a number of verbs you may find useful as you construct instructional behavioral objectives for your related subjects training efforts. Note that the verbs are classified as either comprehension or application. The task or activity to be performed on the job often can help you decide what verb to choose for the objective.

Step 4: Determine Final Performance Outcome

Decide on the wording of the result of the performance. Make this notation short but precise. The job task/activity analysis is the best source of this information.

Step 5: Determine Level of Successful Performance

Determine how well or to what standard the performance must conform. The standard is composed of two parts, the criterion and the level of success. The criterion is a statement of aspects of the activity such as speed, accuracy, use of equipment and so forth. The level of success is a statement of how well the criterion must be achieved by some measure. Together, they form a standard that serves as an absolute against which to judge apprentice performance. Another chapter in this booklet is focused specifically on developing performance standards.

Table 1: VERBS FOR PERFORMANCE OBJECTIVES

Comprehension		Application	
convert	match	apply	employ
defend	name	appraise	examine
define	recall	calculate	experiment
describe	recognize	categorize	illustrate
discuss	record	change	inspect
distinguish	relate	classify	interpret
estimate	repeat	compare	inventory
explain	report	compute	operate
express	restate	contrast	outline
generalize	review	criticize	practice
identify	rewrite	debate	question
list	tell	demonstrate	relate
locate	underline	diagram	schedule
		differentiate	show
		discriminate	sketch
		distinguish	solve
		dramatize	test
			use

Step 6 Specify Conditions

Specify conditions for the performance You as an instructor must decide when, where and with what equipment each apprentice performance associated with learning must occur The important consideration is that you must decide about these factors before testing so that the performance conditions are standardized for all apprentices Further, advance planning permits you to handle or anticipate many of the problems that arise during instruction or testing The specific factors or conditions you must consider and control are

- time of performance,
- time allowed for completion of task,
- temperature, light, ventilation,
- resources needed such as materials, supplies and equipment, and,
- level of difficulty of operation to be performed

Consider each of these factors both at the time of objective development and when preparing the directions for a test

Step 7: Write Full Objective

Combine the parts of each objective in written form using the structure in Figure 5.

Example

Paula Margolas was a related subjects instructor in an apprenticeship and training program for printers The program was located in a large midwestern city and sponsored by the local JATC representing the union and employers. Margolas, a union member and six-year journeyman was assigned as an instructor in the first year of related studies. Topics to be covered included technical English, law and labor relations, safety, basic materials and basic measurement

She set about the task of generating performance objectives for each topic of content For example, in the area of law and labor relations she was to cover the topics of roles of unions, common worker benefits and collective bargaining. Margolas listed each of these topics on a page and outlined the specific major points of information to be covered during that segment of instruction For common worker benefits, for example, she listed unemployment insurance, workman's compensation and wage and hour considerations She then proceeded to work through the steps outlined in this module to develop performance objectives She reviewed the content, decided who would perform, decided upon the level and type of operation involved in performance, determined the standards for successful performance and articulated the conditions for performance. She formalized this information by developing a performance objective for each major information point within each topic of instruction Several of her objectives read as follows

1 Each apprentice will demonstrate the appropriate procedure for filing for worker's compensation for work-related accidents in a simulated in-class setting with no more than one mistake in the seven prescribed operations

2 Each apprentice will recall the responsibilities of the Wage and Hour Commission on a matching test by correctly identifying all of the issues that the Commission oversees

3 Each apprentice will list in a written form in ten minutes and without error the procedure for filing a claim through the State Employment Office

With these objectives Margolas could plan instruction, explain what was expected of the apprentices and develop her evaluation instruments

Additional Information

You may find that reading sources like the following will help you prepare effective performance objectives

R.F. Mager. *Measuring Instructional Intent* (Belmont, California Fearon Pitman Publishers, Inc , 1973)

R.F Mager *Preparing Instructional Objectives* (Belmont, California. Fearon Pitman Publishers, Inc , 1962).

Self-Test Exercises

Please answer the following questions in the space provided or on separate work paper. Check your answers by referring to the appendix in the back of the booklet.

1. In the following objective, underline the series of words that constitute the criterion level.

   Given ten historical incidents about labor relations, on a paper and pencil test, each apprentice will correctly match 9 of the 10 incidents with the title of the labor legislation the incident affected.

2. What do the *conditions* of the behavioral objective specify?

   _____

   _____

3. Indicate in the space to the left the type of reasoning expressed in each of the following phrases.

   _____ A. Given bathroom specifications, the apprentice will calculate the amount and cost of tile needed to cover the prescribed surface.

   _____ B. The apprentice will employ 4 of 5 supervisor suggestions.

   _____ C. Given a need to drill a hole, the apprentice will select and use the appropriate tool and

   _____ D. The apprentice will list the major historical advantages of union membership.

   _____ E. The apprentice will distinguish among the types of drawings on the blueprint and use the orthographic views.

4. Skill: Establish Standards for Successful Performance

Introduction and Objectives

A standard is a rule, operation or product through which a judgment can be made about apprentice performance A standard consists of two parts (1) the criterion or element of performance to be examined and (2) the level of success of performance for that single element or criterion.

A standard can be set for any or all of the tasks or activities of a trade or craft It is fundamental to the instructional process because it sets forth definitively the terms that separate successful and unsuccessful performance by an apprentice As an instructor, you must determine both the elements of performance and the level of success that will separate successful from unsuccessful performance Often industry standards will help you in this task

As you work through the following materials, you will consider how to make decisions about performance standards that permit you to distinguish successful and unsuccessful performances When you have completed your work in this unit of materials you will demonstrate your competence in this skill by being able to

1 Distinguish and define the various types of criteria that may be applicable to related instruction.
2 Analyze a related studies situation and suggest appropriate types and levels of criteria that might be useful to assess performance.
3 Indicate where information about such criteria may be found.

As you work, recall your prior related subjects experience, both as an instructor and an apprentice. What types of standards were established as minimum requirements for demonstrating successful mastery of necessary knowledge and skills?

Why Establish Performance Standards?

Suppose that one intended outcome of your instruction is ability to calculate surface areas of forms found in construction blueprints. Further, suppose that the formulas for determining areas are part of the prescribed related subjects content. As you prepare your instructional unit about areas, you must decide what each apprentice must learn and demonstraate about calculating surface areas of geometric forms. Then you must create a learning situation that enables apprentices to learn and to demonstrate their skills and knowledges

Your first considerations after deciding specific content are to decide (a) precisely what facts or elements or criteria of knowledge and skills are required and (b) what constitutes successful performance of those knowledge and skills Would successful performance, for example, mean that an apprentice will calculate correctly the exact area of any geometric form you might present to the apprentice? Perhaps successful performance would mean that a trainee would solve correctly 90 percent of a set of problems on area drawn from a typical set of blueprints Whatever you select as the indicator of successful performance, you must establish a level of success or benchmark that is the minimum successful performance and against which each apprentice performance can be compared in order to determine its value. Likewise you must determine the criteria or characteristics of performance on which to judge levels of success. Criteria or elements of performance mean things like speed and accuracy The questions you must answer are -for example: should speed and accuracy on use of equipment be a critical factor in distinguishing successful from unsuccessful performances?

Standards serve as reference points for judging performance of apprentices. They consist of two parts, a *criterion* and a minimum *level* of success By comparing the apprentice's performance to the standards, you as a related subjects instructor can determine precisely *what* skills and knowledges each apprentice has mastered as well as *how well* the skills and knowledges have been learned. The *what* is a description of the knowledges and skills possessed and exhibited by each apprentice in terms of behavior and performance elements; the *how well* is a description of the relative success of the performance as compared to some absolute. Both pieces of information are essential in the overall instructional and evaluation process.

Establishing standards for assessment of apprentice skills and knowledges is important for several reasons. First, using standards gives meaning to your instructional planning and evaluation activities Standards permit you to clarify expectations, to certify resulting skills and to improve instruction. Second, standards enable you to report apprentice progress to the program sponsor. They express and describe apprentice performance Third, using standards provides reference points that make feedback to apprentices about their performance comprehensible and useful Fourth, stand

ards permit you to judge the appropriateness of instructional materials and exercises in comparison to expected outcome criteria and levels of success.

Remember, standards are established before instruction begins as a part of the instructional planning process. They become part of the overall performance objectives and Plan for Instruction. They must be explained to apprentices at the beginning of the instruction and should be referred to before and after each test. Each apprentice's performance is compared to the standard rather than to the performance of another apprentice. Further, apprentice performances are either right or wrong since the standards are absolute.

Standards may be stated in a variety of ways depending upon the skills and knowledges to be learned. Usually the half of the standard called criteria are qualities of the skill being learned. Qualities of skills that you might consider in writing standards are:

- percent of items correct.
- degree of product quality.
- degree of appropriateness of procedures.
- speed of performance.
- adherence to directions.
- economy of effort.
- work standards such as adherence to specifications.
- accuracy, and
- use of equipment, materials, techniques, and so forth

The "level for success" part of the standard must not be either too high or too low. You must make the level for success realistic in terms of the knowledge and skill necessary to perform competently on the job or task. Further, remember, you can adjust the level over time, as needed, based upon experience and changes in work requirements.

Usually there is useful information available to you as you develop the criteria and level of success of standards. For example, some industries have national guidelines that suggest minimum content knowledges and sometimes the criteria or qualities of performance. Most local JATC's will assist you in setting forth a listing of skills and knowledges that must be learned together with suggested criteria and indicators of success. In many instances, your practical experience as a tradesperson will suggest appropriate skill and knowledge levels necessary to work effectively on the job.

Other sources of information include data about how past groups of apprentices performed and the levels established by other related subject instructors. However the best sources of information are journeymen on-the-job. Your criteria and levels for success should be the skill and knowledge level of beginning journeymen or prerequisites for skills and knowledges to be learned later in the apprenticeship training period.

How To Establish Standards for Performance

The steps for establishing standards to use in determining the learning of skills and knowledge by apprentices are discussed below.

Step 1: Review Outcomes and Content

Review course content and intended performance outcomes for the content. Consider the work of a journeyworker in the trade or occupation and determine *when* and *how* the course outcomes and contents are used in daily work activites. As you consider the content and outcomes, decide how important each content and outcome is compared to the others. Rank each in order of importance to the others. Then decide how you can tell if a new journeyworker possesses those skills or knowledges as you watch him or her work. Consider measures such as procedures, speed, accuracy and so forth.

Step 2: Identify Instances of Competence for Elements

List all the ways you can tell when a journeyman or apprentice has the knowledge or skill in question next to each of the performance outcomes or content areas. These are criteria for performance.

Step 3: Not How Well Something Must Be Done to be Called Successful

Examine each of the ways you can tell if someone has a knowledge or skill listed for each suggested outcome or content. How well does each of the ways listed have to be performed? What is the standard for performance? Are there tolerance or time or accuracy limits to the knowledge or skill? If so, list them on the same line with each outcome and observation. These are the levels of success for each performance.

Step 4. Adapt Criteria to Related Subjects Setting

Now consider your related subjects setting. Which of the criteria can be adapted to that setting? Are the criterion levels for success appropriate to the classroom? If not, consider the other listed criteria and success levels.

Step 5: Select Criteria and Level of Success

Select at least one criterion and one level for success for each of the contents and performance outcomes you have listed. If possible, select or develop a second

or alternative criterion and level of success that is specifically geared to the related instruction setting. This second criterion might be a percentage of items correct on a test or something else more clearly classroom related. Ultimately, you should have two criteria and a level for success for each, for each performance outcome or content for your course.

Step 6: Incorporate Data Performance Objective

Add the criteria and level for success to each performance objective. Construct your evaluation instruments and scoring procedures according to the information.

Example

Lawrence Krenski was a tradesperson hired by the local JATC and the local community college to provide 144 hours of related subjects instruction to machinist apprentices. As a journeyworker and in cooperation with the local JATC, he determined the desired outcomes that were to result from participation in related instruction. Using the national guidelines, an outline of former related subjects courses and his own trade experience, Krenski identified the course content and divided it into instructional units. He listed the outcomes and contents of a machinist related subjects course in priority order. As he thought about his work as a journeyman and the work of people under his supervision, he confirmed his priority order for the content in this section. Further, he identified the qualities of the skills and knowledges in the content unit that he believed demonstrated whether a journeyman possessed the skill or knowledge in question. Krenski listed these items on a page as illustrated in Figure 6. Recall that the ways to determine if a journeyman has skills and knowledges are called criteria or qualities of the skill.

Next Krenski considered each skill or knowledge and its criterion in order to determine the degree of permissable tolerance in a successful performance. For example, for recognition of the appropriate scale to use, Krenski knew that a beginning journeyworker had to be correct 100 percent of the time, however, beginning apprentices only had to be correct 90 percent of the time. He believed that when selecting and using the proper caliper in every situation, a beginning apprentice had to be correct 95 percent of the time whereas a journeyman had to be correct 100 percent of the time. Krenski entered these values on the appropriate lines of the figure that contained the contents and criteria. These figures are called the minimum levels of success for each criterion.

After considering the minimum level of success for apprentices and journeymen for each suggested criterion, Krenski considered how each criterion and level of success could be applied in a related subjects classroom. For example, he decided that for testing the selection and use of the appropriate caliper, he would provide each apprentice with a set of work situations and require the apprentice to select and use the appropriate caliper and record the answer. The apprentice would be graded on the appropriateness of selection, on the speed of response and on the accuracy of the answer provided. Further, based upon his consideration of the work setting, Krenski decided that to perform successfully, each beginning apprentice would have to select the proper instrument nine out of ten times and would have to answer all thirty problems in 15 minutes. Further, to be counted as correct, an answer would have to be within ± 1 mm of Krenski's suggested answer.

Having made these decisions, Krenski entered the information in his performance objectives and constructed his tests. He had determined the criteria of performance for this portion of course content.

Additional Information

You may find that reading sources like the following will help you develop appropriate standards for performance.

W.P. Gerth, R.P. O'Reilly and P.D. Pinsk. *Comprehensive Achievement Monitoring* (Englewood Cliffs, N.J. Educational Technology Publications, 1975)

R.F. Mager. *Measuring Instruction Intent* (Belmont, California; Fearon Pitman Publications, Inc.)

Figure 6: CONTENTS AND CRITERIA FOR ONE UNIT OF RELATED INSTRUCTION FOR MACHINISTS

Contents/Outcomes	Criteria
I. MEASURING DEVICES	
A. Scales—functional and decimal	Accuracy
B. Calipers	
1. Regular Micrometer (inside and outside)	Appropriateness, Speed, Procedures, Accuracy
2. Vernier Micrometer (inside and outside)	Appropriateness, Speed, Procedures, Accuracy
C. Dial indicators	Speed, Procedures, Accuracy
D. Optical comparators	Appropriateness, Accuracy
E. Flats	Appropriateness, Accuracy
F. Angle and taper measuring	Accuracy, Use of Equipment, Speed
G. Gages and gage blocks	Appropriateness
II. MEASURING SYSTEMS	
A. Linear measure	Accuracy (% correct)
B. Area measure	Accuracy (% correct)
C. Volume measure	Accuracy (% correct)
D. Weight measure	Accuracy (% correct)
E. Gages/pressure measure	Accuracy (% correct)

Self-Test Exercises

Please answer the following questions in the space provided or on separate work paper. Check your answers by referring to the appendix in the back of the booklet.

1. Check each item that is a type of criterion that might be used in a related subjects course.

   (a) accuracy
   (b) speed of performance
   (c) percent of items correct
   (d) use of equipment
   (e) degree of appropriateness
   (f) degree of quality
   (g) economy of effort

2. Check the letter of the item that is the best completion for the following statement.

   The best source of information for establishing realistic criteria for success is:

   (a) journeyworker activities on-the-job
   (b) information from others (and former) related subjects instructors
   (c) your experience as a former apprentice and journeyman
   (d) curriculum and content outlines for instructional materials

3. Consider the materials on safety in your trade and your related subjects course. Using the format below, list major topics of concern and for each topic suggest at least one criterion that could be used to determine if an apprentice possesses the knowledge or skill. Next, consider each listed criterion and suggest what you consider to be a reasonable level of success that demonstrates mastery of the topic. Check your answers against the steps in this unit and against the suggestions offered in the back of this booklet.

SAFETY		
Topic	Criterion	Level of Success
1.		
2.		
3.		

4. Based upon the information in the following situation, suggest the ideas that might be used to establish acceptable standards.

   Pat Hendrick, a journeyworker machinist in automotive manufacturing with eight years of experience with a national manufacturer, recently has accepted a position as a related studies instructor in a machinist training program taught in conjunction with a local JATC and the area community college. The course has been offered for several years and uses instructional materials supplied by the international union. Pat, a former apprentice, currently works full time in a shop with five other journeymen and several apprentices. Her problem is that she is concerned about setting appropriate levels for successful performance. To what sources might she refer as she attempts to set class standards?

5. Skill: Provide for Appropriate Use and Variety of Instructional Time, Activities and Materials

Introduction and Objectives

Once you have identified necessary content and expected learning outcomes and have written the performance objectives, turn your attention to *when* and *how* the content will be offered in the related subjects experience. The "when" and "how" of providing content is a necessary related instructional task regardless of whether the experience is offered as a class or as an individual activity. You must make decisions about the amount of time allocated to each topic for the average apprentice, the general sequence of instructional activity, types of instructional materials needed, the general types of learning activities and the timing of evaluation activities.

Such information is compiled in a document called a Plan For Instruction (PFI) to which you can refer throughout the related subjects experience. The PFI is a composite of a curriculum guide and a unit plan, but not as detailed as a daily lesson plan. Daily planning is a skill explained in another instructor learning module.* Construction of the PFI requires you to use a set of competencies associated with planning instruction that you should have acquired by the time you complete your work in this chapter. You will demonstrate your competence by being able to:

1. Suggest and discuss the factors that must be included in a Plan for Instruction, and
2. Develop a PFI for your own related subjects responsibilities.

How to Construct a Plan for Instruction

The degree of formality of your PFI is entirely up to you. However, there are a series of decisions you must make that will result in *what* content is covered *when* in related subjects instruction. Consider and use the following steps in making those planning decisions and in developing the PFI. The majority of steps are related to decisions you must make; some steps can be eliminated if your program has a policy that eliminates the necessity of your making the decision.

Step 1: Construct PFI Chart

Construct a PFI chart like that displayed in Figure 7. You will be adding information under each heading.

Step 2: Enter Content and Objectives

Fill in the content and the performance objectives sections for the various topics of related subjects instruction. List the content and objectives in order of importance. This information is the product of skills one; two and three of this module.

Step 3: Enter Time-Length

Determine or review from your job analysis the importance of various content and topics. The relative importance of each content and its performance objective should be assigned a number and translated into the amount of time to be spent on the subject. More critical subjects require and deserve more time. List the number of hours in a year of related subjects instruction—at least 144 as a minimum—and determine the number of hours of content time per apprentice for the various subjects within that 144-hour total. In other words, the total number of hours at the bottom of the column entitled "Degree of Emphasis in Time" should equal the number of hours in a year's work of related subjects instruction. The relative importance of the content areas should have been determined during the earlier job analysis.

Step 4: Determine Sequence

Determine the sequence of content presentation. There are several techniques for determining the sequence of information presentation. For example, you might simply refer to the job analysis you completed earlier and provide instruction in conjunction with the chronological order of job activities and tasks. A second way to determine sequence is to gear material to the tasks each apprentice (or the majority of apprentices) is currently performing on the job. To do this, you must communicate frequently with apprentices and their supervisors. A third way to determine content sequence is by level of difficulty of material and prerequisite information. When using this particular technique, the easier material and the prerequisite material are introduced before the difficult material within each subject area. A forth way to sequence content is to group it according to work activity. In this technique, each activity and its objectives are presented as separate units and completed before moving to the next. Remember, the choice is yours, but be consistent. Do not make this task more difficult than it needs to be. It simply means that you should decide in advance in what approximate order the various topics in related

* See *Presenting Information to Apprentices*, Instructor Training Module #5 for more information on the subject.

Figure 7: PLAN FOR INSTRUCTION

Content	Performance Objectives	Degree Of Emphasis (In Time)	Sequence Materials	Activities	Time For Evaluation

Step 5· List Expected Instructional Activities

The next section of your Plan For Instruction has been titled Activities. In this section, for each performance objective and content study, make general notes about four things. First, include items about how you plan to introduce and present the materials. For example, if you expect to use a demonstration in conjunction with reading a chapter of textbook and viewing a film, make notes to that effect. Do not go into detail about how you might deal with each instructional period on a topic. Just list your general intentions about how you will teach the subject matter.

Second, note expected apprentice learner activities. Such activities might include reading, on-the-job observation assignments, handouts, use of models and so forth.
subjects instruction will be covered in class. Remember that you may change the order as class proceeds.

Third, note any equipment needs you will have during this period of instruction. If you will need a slide projector or a model or a tool, indicate your need on the PFI.

Fourth and last, consider how you will find out, during class, if the apprentices are learning the necessary information. Do you expect to ask certain questions, use handouts or have apprentices perform demonstrations? However you think you will check on learner progress, note the procedures.

Again, make very brief notes and do it for entire topics, not for single class periods. Remember that the PFI provides an overview or a general picture of the entire related subjects program instructional content for which you are responsible. Refer to it throughout the entire related subjects instructional period as you prepare to teach each day. It will help you to keep in perspective the overall thrust of the course regardless of the type of program you operate.

Step 6· Suggest Times for Evaluation

As you consider the overall related subjects instructional program, you will find it useful to record for later reference the approximate times during which you will evaluate apprentice learning. For example, some topics may require testing on that topic alone immediately after you have completed the instruction, others may be better handled when combined with other topics and assessed every month or two. Again, brief notes will suffice. They are for your later reference and future effort.

Example

Even though Michael Smith had taught related subjects instruction in a radio and television repair apprenticeship program for several years, he was not satisfied with his teaching. He felt as if he was never completely prepared and that the course was fragmented; further,

his sense of fragmentation had been heightened since adopting an individualized instructional format for his efforts last year. In order to help Smith deal with this problem, a fellow instructor in an apprenticeship program for air conditioning and refrigeration repair suggested this module of training material to Smith. As he read, he used his class as an example and performed each skill, one step at a time. As he began to construct his Plan For Instruction, it all fell into place in his mind. This was the tool he would use to reduce the fragmentation, to be sure he was prepared and to keep tabs on the progress and activities of each of the ten apprentices in his charge. Smith worked through the steps suggested for the PFI, realizing that once he had this tool, it was acceptable for each apprentice to be doing something different. In the end, he would still be able to verify that each learner had completed all the work expected during this entire year of related subjects instruction. He would simply match the apprentices' on-the-job activity to related content and ensure that an appropriate

Figure 8: PFI EXCERPT: MICHAEL SMITH

Content	Performance Objectives	Degree of Emphasis (Average Time Length)	Sequence of Materials	Activities	Time for Evaluation Mastery	Type of Evaluation
Safety						
Shock Prevention "Hot Chassis" Ground Fault	*Each apprentice will answer correctly 18 of 20 written questions.*			*Presentation and film*		
Grounding	*Each apprentice will correctly discuss each of 20 grounding situations.*	*20 hours*	*As listed in content*	*Demonstration, pictures and presentation*	*Each class period*	*Knowledge-identification type test*
Double Ins. Tools	*Each apprentice will correctly demonstrate selection and use of each tool.*					
Shock First Aid Voltage/skin relationship Increasing current levels	*Each apprentice will indicate correctly what to do for each of 10 situations.*	*2 hours*	*As listed in content*	*Presentation and pictures*	*Day of instruction*	*Situation type, short-answer text*
Current Calculations						
Ohms Law Voltage Current Resistance Impedance Reactance						

amount of time was spent by each apprentice in mastering the content. Further, he could keep track apprentice learning by referring to the PFI. A portion of Smith's PFI for basic safety instruction is illustrated in Figure 8. Note his brief remarks, they are enough to cue his memory as he refers to the PFI throughout the related subjects instructional period.

Self-Test Exercises

Please answer the following questions in the space provided or on separate work paper. Check your answers by referring to the appendix in the back of the booklet.

1. List each step or factor in constructing a Plan For Instruction.

2. Construct a PFI for a portion of your related subjects instructional program.

6. Appendix

Answers To Self-Test Exercises

2. *Skill. Identify Specific Knowledges, Skills, and Attitudes for Inclusion in Related Subjects Instruction*

1 Steps in the job analysis process:

a. Construct activities listing chart
b. Identify work activities as well as importance and freuqncy of tasks
c Identify equipment used
d Identify necessary outcomes and quality of performance
e Note job context circumstances
f. Note safety requirements

2 Categories of suggested content:

a Safety
Toxic substances
Noise
Protective devices

b Mathmatics
Whole numbers
Fractions
Use of tables

c. Measurement
Determine weight
Use of Tables
Determine angles

d. Working in Organizations
Constructive criticism
Pride in work
Working under supervision
Time cards/paychecks

e. Introduction of Apprenticeship
Provisions of apprenticeship
Apprenticable occupations

3. The elements you must include at a minimum are:

a. Compile and assemble outside suggestions and requirements for inclusion in content.

b. Analyze jobs in craft or trade in which apprentices are training to develop a list of job activity and tasks, note equipment used, expected quality of performance, context vriables, and importance of activities.

c. Examine activities and determine the knowledges required to engage in each activity.

d. Group knowledges and determine which are appropriate for inclusion in related subjects instruction.

3. *Skill: Develop and Specify Performance Objectives for Related Subjects Instruction*

   1. 9 of the 10 incidents
   2. Factors such as when, where and with what equipment, performance associated with learning must occur.
   3. The types of reasoning expressed in the phrases are:

      a. Application
      b. Application
      c. Application
      d. Comprehension
      e. Application

4. *Skill: Establish Standards for Successful Performance*

   1. a, b, c, d, e, f, g
   2. a
   3. You should have considered each of the following factors.

      a. Importance and frequency of use of skill or knowledge
      b. Ways used on job and how you know if it is being done correctly
      c. Numbers and types of ways to tell if it is being done correctly
      d. Are speed, accuracy, use of equipment and so forth important to successful performance?
      e. What are minimum levels of successful performance?
      f. What can be adapted and taught in related subjects?

   4. Ideas include her own experience, observation and discussion with other journeyworkers in the shop in which she works, previous related subjects instructional experience, materials from the instructional training trust; sponsor ideas; and community college standards.

5. *Skill: Provide for Appropriate Use and Variety of Instructional Time, Activities and Materials*

   1. Steps in constructing a Plan for Instruction:

      a. Construct PFI chart
      b. Enter content and objectives
      c. Enter length of time of instruction
      d. Determine sequence
      e. List expected instructional activities
      f. Suggest time for evaluation

   2. Does your own PFI address each of the concerns listed in 1a through 1f above? Be sure that it does

POSTEST

Directions. Read the following questions and write your answers in the space provided. Check and score your answers with the answers provided in the appendix. If you answer at least 65 percent of the questions correctly, continue with your work in Module #4. If not, repeat the sections of this module with which you had greatest difficulty.

1. Group the following topics under the most appropriate of the suggested subject headings,

   Topics Lifting materials, solving for unknowns, calculating areas, estimating material needs, working under supervision, characteristics of materials, work rules, protective clothing, estimating job costs, reporting accidents

   Subject Headings
   Safety Mathematics Science Working in Organizations

2. Examine the following list of items to consider during a job analysis? What critical factor is missing from the list?

   - activity
   - frequency of occurance of activity
   - equipment/materials/supplies used
   - performance outcomes
   - job context concerns
   - applications
   - importance of activity
   - _____

   Recall that two types of reasoning, comprehension and application, were discussed in the text Indicate in the space to the left of each of the following phrases the type of reasoning involved in answering the questions

3. _____ Given a blueprint of a house the apprentice will estimate the number of cedar shakes required to cover the roof.

4. _____ The apprentice demonstrates how to use the micrometer to measure the part.

5. _____ The apprentice will list appropriate safety procedures for lifting heavy objects.

6. Circle the letter of the item that is *not* a necessary step in constructing a Plan for Instruction

   A) Determine daily content plans.
   B) Sequence topics and materials
   C) Decide on how much time and effort to devote to each subject and topic
   D) Consider when and how to evaluate each topic

Read the following objective and answer the questions associated with it.

Each apprentice will calculate, on paper, area and perimeter values for twenty problems drawn from a working blueprint. The test will be completed in 30 minutes and must be taken within the next 6 weeks To pass, at least 90% of the problems must be answered correctly to within 1 foot of the exact measure.

7. What behavior must be performed by the apprentice to demonstrate mastery?

   Answer:_____

8. Underline the words that set forth the conditions under which performance will occur.

9. Please write out the standard to which the apprentice must perform in order to be successful.

   Answer:_____

10 Circle the number of the item that provides the least acceptable statement of the conditions for a hypothetical objective:

A) . successful demonstration requires that you use a ruler, saw, marking device and not more than 10 linear feet of board . .
B) . . 80 percent of the answers must fall within ± ½" of the exact answer . . .
C) . . . during a 15 minute paper and pencil test . . .
D) . . on a test that may be completed at any time during the next three months.

11 Recall that the half of a standard is called the criterion. It is the qualities of the skill being mastered. Suggest at least three qualities that could be used as criteria for the content topic of using measuring tools.

Answers: _____

_____

_____

12 Circle the letter of the item that is the best source of information for establishing realistic criteria for success.

A) your experience as a former apprentice and as a journeyman
B) curriculum and content outlines for isntructional materials
C) information from other instructors
D) journeyman activities on the job

POSTTEST ANSWERS

1. Subjects and Topics (1 point for seven correct)
   (2 points for all ten correct)

Safety	Mathematics	Science	Working in Organizations
Lifting materials	Solving for unknowns	Characteristics	Working under supervision
Protective clothing	Calculating areas	of materials	Work rules
Reporting accidents	Estimating material needs		
	Estimating job costs		

2. Safety considerations is missing

3. Application

4. Application

5. Comprehension

6. A

7. Calculate (answers to problems)

8. Underlined words should be. on paper . . . The test will be completed in 30 minutes and must be taken within the next 6 weeks.

9. To pass, at least 90% of the problems must be answered correctly to within 1 foot of the exact answer.

10. B

11. Any three of the following. A) selection of appropriate tool, B) accuracy of measure, C) proper procedures and care in demonstrating use, D) speed of use; E) economy of effort

12. D